(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 July 2003 (24.07.2003)

PCT

(10) International Publication Number
WO 03/059778 A2

(51) International Patent Classification[7]: B65D 81/00

(21) International Application Number: PCT/EP03/00384

(22) International Filing Date: 13 January 2003 (13.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02000943.7 16 January 2002 (16.01.2002) EP

(71) Applicant *(for all designated States except US)*: **SOCIETE DES PRODUITS NESTLE S.A.** [CH/CH]; P.O. Box 353, CH-1800 Vevey (CH).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DENISART, Jean-Luc** [CH/CH]; Le Vigny 2, CH-1096 Cully (CH). **CAHEN, Antoine** [CH/CH]; Les Ateliers du Nord, Place du Nord 2, CH-1005 Lausanne (CH). **YOAKIM, Alfred** [FR/CH]; Ch. de la Routiaz 2, CH-1806 St-Légier-La Chiesaz (CH).

(74) Agent: **THOMAS, Alain**; Avenue Mestlé 55, CH-1800 Vevey (CH).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

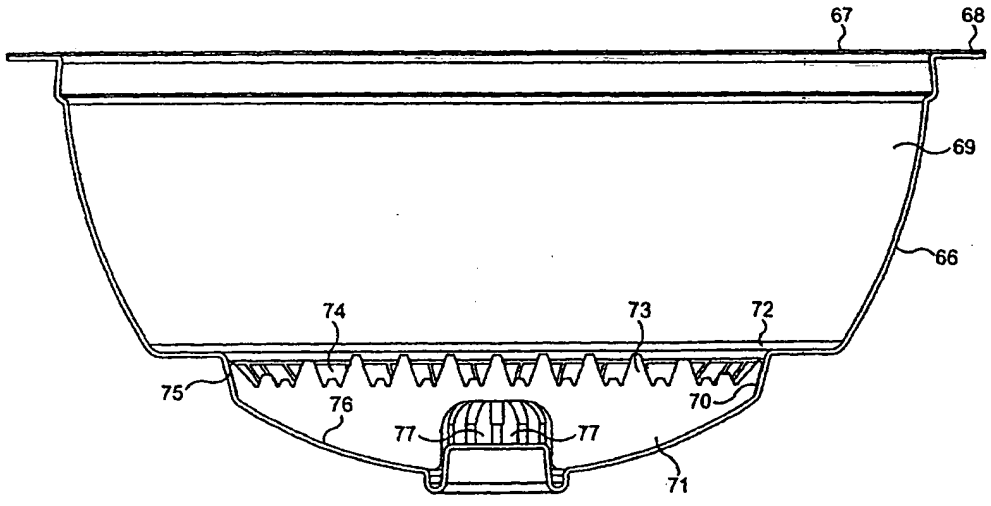
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent*

[Continued on next page]

(54) Title: CLOSED CAPSULE WITH OPENING MEAN



(57) Abstract: The present invention relates to a closed capsule designed to be extracted under pressure in an extraction device, containing a substance (43) for the preparation of a beverage, comprising a closed system (44, 45) containing the said substance and a means (46, 48) inside the said system allowing the said capsule to be opened at the time of its use and allowing the said beverage to flow out (49) without contact with its extraction system.

WO 03/059778 A2

(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Closed capsule with opening mean

The present invention relates to a capsule designed to be extracted under pressure and containing a substance for the preparation of a food product such as a beverage.

Cartridges designed to be extracted under pressure and containing a substance for the preparation of a beverage already exist on the market. Patent EP 0512468 in the name of the Applicant Company relates to such a cartridge. The cartridge is intended to be inserted into an extraction system. The cartridge is thus opened against a supporting part of the system comprising raised elements under the effect of the pressure of the fluid entering the cartridge. The problem with this cartridge is that the beverage extracted from the cartridge runs over this supporting part and through ducting means, which means that it is difficult, if not impossible, for contamination and taste reasons, to envisage extracting with this system cartridges containing substances other than roasted ground coffee, because of the beverage residue present on the said support.

Document GB 1 256 247 relates to a cartridge containing a substance suited for the preparation of a beverage. The cartridge is opened by deforming the lid of the cartridge using an external piston which collaborates with an internal puncturing element. This system is complicated to use in order to open the capsule at the correct moment.

The purpose of the present invention is to make available to the consumer a capsule which does not have this disadvantage, that is to say a capsule which can contain a wide variety of substances to be extracted as needs be, and which allows preparation and outflow of the beverage without there being a need for the

beverage at any time to come into contact with part of the system.

The present invention relates to a capsule designed to be extracted by injection of a fluid under pressure in an extraction device, containing a substance for the preparation of a beverage, comprising a closed chamber containing the said substance and a means allowing the said capsule to be opened at the time of its use and for allowing the said beverage to flow out.

One of the principles of the present invention lies in the fact that each capsule comprises its own opening means activated by the rise of pressure of the fluid introduced into the capsule at the time of its extraction. Another principle of the invention lies in the fact that the capsule has its own outflow passage with its own ducting means making it possible to avoid, or at the very least considerably reduce, contact with the elements of the system or of the extraction device. A result of these principles, taken alone or in combination, is that it is possible one after the other, to extract substances of different types or varieties without prejudice to the taste and without the risk of cross-contamination. The capsules can thus contain substances of very diverse nature and/or variety capable of being extracted or dissolved in water. It is thus possible to envisage any substance that is infused and any soluble substance: it must be clearly understood that both for extraction or for infusion or dissolution, the liquid element is hot, cold or warm water.

A configuration in which the opening means are specific to the capsule also has the advantage that each opening can be tailored and adjusted to suit the nature and/or the variety of the substance to be extracted. In other words, depending on the substance, opening may occur at different pressures and different times in order to

achieve an optimum result.

As a preference, opening is achieved by relative engagement of the opening means with a retaining part of the closed chamber. The relative engagement of the opening means and of the retaining part is thus performed under the effect of the rise in pressure of the fluid in the chamber. The expression "relative engagement" is to be understood as meaning: either the opening means or the retaining part of the closed chamber, or alternatively both can be moved one with respect to the other to effect opening.
In a first principle, the opening means may be housed inside the closed chamber and thus be moved by thrust under the effect of the rise in pressure of the fluid in the chamber against the retaining part of the chamber.

In a second principle, the opening means may be housed outside the closed chamber and the retaining wall is then moved under the effect of the rise in pressure against the opening means. In this case, the means may be housed in the capsule but outside the chamber containing the substance.

The closed chamber of course has to be understood from the closed main part of the capsule which contains the substance to be extracted.

As a preference, the opening means is an element comprising at least one puncturing element. The opening means may thus form a surface comprising a multitude of puncturing elements. Such a configuration is preferred because such a surface acts as a pressure-spreading means and has the effect of allowing the pressure of the fluid to rise sufficiently inside the capsule before puncturing occurs: it is important to reach this pressure in order for the substance to be extracted and a good-quality beverage to be formed.

As another preference, the retaining wall is a thin film (or lid) able to be punctured. The retaining wall contributes to closing the chamber just like other elements forming the container for the substance to be extracted, such as a cup or other elements. The wall may be a film or a membrane.

The opening means and the retaining wall are defined and arranged, one with respect to the other, in such a way that opening occurs in a determined pressure range, preferably at a given pressure corresponding to the optimum extraction pressure. The extraction pressure may vary from 4 to 8 bar, more preferably, of the order of 6 bar. The optimum pressure may vary according to the substances to be extracted.

The capsule of the invention advantageously also has a means for the collection and outflow of the beverage. Such a means has the purpose of directing the stream or streams of beverage leaving the capsule towards the container, such as a mug, and of thus avoiding any contact with part of the system. The collection and outflow means preferably comprises a part of widened cross section covering the retaining part of the chamber followed by a part of narrowed cross section which concentrates the beverage into one or several favoured directions. The parts of widened and narrowed cross section may form one and the same continuous portion which flares from the retaining part towards one or more outlets of the capsule. Such a portion may, for example, be a cup portion of concave internal shape directed downwards, which end in at least one outlet hole.

There are various embodiments of the closed capsule according to the invention. According to a first embodiment of the capsule according to the invention, the closed chamber comprises two welded half-shells, symmetric or otherwise, and the means allowing opening is a rod arranged between the said shells, the said rod

comprising at least one opening, preferably several openings, towards the top or at its upper end for the entry of water and, towards the bottom, or at its lower end, a shape allowing the weld of the two half-shells to be punctured as the said capsule is placed in its extraction device, the said shape also forming a filter. The rod preferably has a pointed shape. To extract from such a capsule, the extraction device may simply have a shower head for the arrival of water and a system allowing the rod to move inside the said capsule so as to open the capsule and thus allow the liquid to flow out into the mug arranged under the extraction device. It is necessary that there be a filter element in the pointed part of the rod so as to prevent the coffee grounds from passing into the mug. Of course, for all the embodiments, the capsule contains a certain quantity of substance for one mug, or two, or more: the quantity may preferably vary between 4 and 30 g.

In a second embodiment of the capsule according to the invention, the closed chamber comprises a cup and a membrane welded to the periphery of the cup and the means allowing opening is arranged in the bottom of the cup and comprises a disc with a puncturing means puncturing the bottom of the said cup through the rise in pressure inside the said chamber at the time of extraction. During insertion of the capsule in the extraction system, it is necessary to have one or more sprinkling elements which puncture the membrane and allow water to enter the said capsule, so as to pre-wet the coffee or other substance, so that the pressure in the capsule can rise and therefore cause the disc to move from a convex position to a concave position, this moving the puncturing means which thus punctures the bottom of the cup. The disc of this capsule has a sealing role and at the time of puncturing, the underside of the disc has means allowing the substance to be filtered for the passage of the desired beverage.

The puncturing means may have any possible shape, for example points, blades, knives, needles and the like. The sprinkling elements may be in the form of blades, points, knives, needles and the like.

In a third embodiment of the capsule according to the invention, the capsule comprises a cup and a membrane welded to the periphery of the cup and the means allowing opening is arranged on the membrane and consists of an element with a puncturing means puncturing the said membrane through the rise in pressure inside the chamber. By comparison with the previous embodiment, instead of arranging the opening means in the cup, this means is arranged in the membrane, but the opening process remains the same, namely that the puncturing means will puncture the membrane instead of the cup. The disc will still have a sealing function and will comprise filtering means.

In a fourth embodiment, the capsule comprises a cup with a rim and a bottom having an opening for the outflow of the beverage and a membrane welded to the periphery of the rim of the said cup and the means allowing opening is arranged in the bottom of the cup and is an element with puncturing means covered by a thin film, this thin film opening on the puncturing means at the time of extraction. The puncturing means also have a filter function. In this embodiment, the element with the puncturing means remains fixed, and it is the thin film which deforms under pressure and opens on the aforementioned puncturing means. Just as in the previous embodiment, it is necessary to have one or more sprinkling elements to puncture the membrane, so as to pre-wet the coffee and have a rise in pressure in the capsule, so that the thin film is deformed and thus tears on the puncturing means. The capsule is of substantially circular cross section. The diameter of the means allowing the opening of the capsule is non-critical. The capsule according to this embodiment

normally has a ratio of diameter of the means allowing opening to the diameter of the capsule of between 1:6 and 1:1.

In this embodiment, there are two options. The first is for the element allowing opening to be a separate piece, arranged in the bottom of the cup; this piece comprises a flat part with the puncturing means and a fairly curved face pressing against the bottom of the cup. The puncturing means are non-critical and may be blades, points, knives, needles, recessed and raised elements of cone-shape, pyramid-shape or any other geometry. The second option is for the means allowing opening to consist of a disc with recessed and raised elements, the said disc being placed on a rim of the bottom of the cup, the said bottom having, substantially at its middle, an opening for the outflow of the beverage. The recessed and raised elements may be of cone-shape, pyramid-shape or any other geometry.

In the fifth embodiment, the capsule comprises a cup with a rim and a bottom having an opening for the outflow of the beverage and a membrane welded to the periphery of the rim of the said cup and the means allowing opening consists of recessed and raised elements forming the bottom of the said cup covered by a thin film, this thin film opening on the raised and recessed elements at the time of extraction. The thin film also has a filter function. In this embodiment, the recessed and raised elements remain fixed, and it is the thin film which deforms under the pressure and opens on the said aforementioned recessed and raised elements. Just as in the previous embodiment, it is necessary to have one or more sprinkling elements to puncture the membrane, so as to pre-wet the coffee and have a rise in pressure in the capsule so that the thin film is deformed and thus tears on the recessed and raised elements. The capsule is of substantially circular cross section. The diameter of the means

allowing opening of the capsule is non-critical. The capsule according to this embodiment normally has a ratio of the diameter of the means allowing opening to the diameter of the capsule of between 1:6 and 1:1. In this embodiment, the recessed and raised elements form the bottom of the capsule. The recessed and raised elements are non-critical and may be of diverse geometric shape, for example of cone-shape, pyramid-shape or any other geometry.

In a sixth embodiment, the capsule comprises a cup and a membrane welded to the periphery of the cup and having an opening for the outflow of the beverage and the means allowing opening is arranged in a housing at the centre of the membrane and consists of an element with puncturing means covered by a thin film, the said thin film tearing on the puncturing means at the time of extraction. These puncturing means also have a filter function. By comparison with the previous embodiments, instead of having the opening means in the bottom of the cup, it is arranged at the centre of the membrane. The extraction process remains the same: the sprinkling means puncture the top of the cup, the coffee is pre-wetted, the pressure rises inside the capsule and the thin film is deformed and opens on the puncturing means. The beverage flows into the container arranged under the capsule.

In another embodiment of the previous solution, the capsule comprises two welded half-shells containing the substance to be extracted, one having an opening for the outflow of the beverage, and the means allowing opening is arranged in the half-shell with the opening and consists of a disc with puncturing means covered by a thin film, the said thin film opening on the puncturing means at the time of extraction.

The puncturing means are the same as those mentioned hereinabove.

In a seventh embodiment of the capsule according to the invention, the capsule comprises a cup and a disc welded to the periphery of the said cup, and having an opening for the outflow of the beverage and the capsule further comprises a means allowing opening comprising a thin film welded between the disc and the cup and raised elements on the disc collaborating at the time of extraction with the said thin film to allow the opening of the said thin film through the rise in pressure and allowing the beverage to flow out directly into the mug. In this case too, in order to extract the capsule, it is necessary to have an extraction device comprising one or more sprinkling elements for the arrival of the water. In a preferred embodiment, the raised elements consist of an annular element around the entire periphery of the disc. In this last embodiment it is necessary for the disc always to be supported by a support element in order to allow the thin film to open.

In this last embodiment, if the substance for the preparation of the beverage is a soluble substance, the thin film is sufficient, although if the substance is insoluble, it is necessary to provide, in the capsule, across the path taken by the beverage, such as under the thin film for example, a filter which will hold the said substance back. The material of the filter is chosen from the group consisting of filter paper, woven fibres and nonwoven fibres. The fibres may be made of PET (polyethylene terephthalate) or PP (polypropylene) or some other polymer.

In the last case, the annular element of the disc may be continuous or discontinuous. In the case of the embodiment of the discontinuous annular element, the disc comprises, between the annular elements, ribs directed towards the centre of the said disc.

It must be clearly understood in all the embodiments of the capsule according to the invention, that each capsule comprises means for collecting and for the outflow of the beverage. Such a means may be formed of a flow duct, so that the prepared beverage does not touch the elements of the extraction machine. The position of this duct is non-critical; it is preferably arranged substantially at the centre of the capsule. The flow duct is advantageously formed of part of the cup and forms an integral part thereof. The duct may have a concave internal shape allowing the beverage passing through or along the edges of the opening means to be collected. The shape of the capsule is non-critical also. The capsule preferably has a substantially circular shape.

It is possible to have a positionable or non-positionable capsule. A positionable capsule is understood to mean one which is not symmetric along its welding plane (referring for example to figure 17) and which may or may not be symmetric along its vertical axis (still in relation to figure 17). A non-positionable capsule is one which is symmetric along its welding plane and symmetric along its vertical axis.

The closed chamber comprises either half-shells or a cup and a membrane, or a cup and a disc. As the case may be, the material of the closed chamber is preferably chosen from the group consisting of aluminium, an aluminium/plastic composite, an aluminium/plastic/paper composite, single-layer or multi-layer plastic. The plastic used is a plastic which is compatible in the sphere of foods and chosen from the group consisting of EVOH, PVDC, PP, PE, PA, in a single layer or as a multilayer. The thickness of material used is between 5 and 100 microns depending on the type of material used.

The puncturing means for the fourth to seventh

embodiments are the same as those mentioned hereinabove.

In embodiments 4 to 7, the capsule comprises a thin film. This thin film is made of a material which is the same as that of the closed chamber.

The substance for the preparation of a beverage is chosen from the group consisting of roasted ground coffee, tea, instant coffee, a mixture of roasted ground coffee and instant coffee, a syrup concentrate, a fruit extract concentrate, a chocolate product, a milk-based product or any other dehydrated edible substance, such as dehydrated stock. It is possible according to the invention with equal ease to prepare a cold, hot or warm beverage.

As already mentioned hereinabove, the great benefit of the capsule according to the invention is that it comprises, on the one hand, its own opening means and, on the other hand, that it allows, with the same extraction machine, to envisage the possibility of extracting substances of different types and/or varieties such as a coffee, followed by a tea, without the consumer when consuming the beverage noticing an aftertaste resulting from the previous extraction. The benefit also stems from the cleanliness that the extraction affords. This means that each capsule has its own outflow which does not dirty the extraction machine. The result of this is less or no cleaning of the machine, greater food safety and hygiene reducing the risks of contamination or proliferation of microorganisms in the machine and finally the possibility of extracting bacteriologically more sensitive substances such as milk powder or other substances with a neutral or weakly acidic pH, for example.

The invention also relates to a process for the

preparation of various beverages in a same machine, in which the liquid of the beverage does not come into contact with the said machine and the capsule is supported from beneath by an element of the said machine. It is also possible that the capsule according to the invention to perform extractions at lower pressures, namely at pressures under 10 bar. The invention also relates to a method for improving hygiene and reducing cross-contamination in the preparation of a beverage from a capsule containing a food substance in a closed chamber, said capsule incorporating its own opening device, characterized in that a fluid is introduced under pressure into the capsule and that, once the pressure inside the capsule reaches a certain level, the opening device is activated to open the capsule and release the beverage.

The opening device is preferably activated by the effect of the internal pressure which becomes established within the closed chamber.

The remainder of the description is given by reference to the drawings in which:
Fig. 1 is a perspective view of the closed capsule according to the first embodiment,
Fig. 2 is a perspective view of the rod of the capsule according to the first embodiment,
Fig. 3 is a schematic sectioned view of the capsule according to the second embodiment,
Fig. 4 is a schematic sectioned view of the capsule according to the third embodiment,
Fig. 5 is a schematic sectioned view of the capsule according to the fourth embodiment (first option),
Fig. 6 is a schematic sectioned view of the capsule according to the fourth embodiment (first option),
Fig. 7 is a perspective view of the capsule according to the previous figure,
Fig. 8 is a perspective view of the means allowing opening of the capsule according to the second option,

Fig. 9 is a perspective view of the means allowing opening of the capsule according to the second option,
Fig. 10 is a schematic section view according to the fifth embodiment,
Fig. 11 is a perspective view of the capsule according to the previous figure,
Fig. 12 is a perspective view of the cup from underneath,
Fig. 13 is a perspective view of the cup from on top,
Fig. 14 is a schematic depiction of the capsule in its extraction system,
Fig. 15 is a schematic sectioned view of the capsule according to the sixth embodiment,
Fig. 16 is a schematic sectioned view of the capsule according to another form of the sixth embodiment, and
Fig. 17 is an exploded view of the capsule according to the seventh embodiment.

Figure 1 clearly shows a half-shell (1), the second half-shell, not depicted, is welded along the welding line (2) and thus closes the capsule (4). This capsule has a housing (3) in which the substance for extraction, for example roasted ground coffee lies. The rod (5) is arranged between the two symmetric half-shells. This rod is depicted in Figure 2 and in its upper part has holes (6) through which the hot water arrives for the preparation of the coffee. This rod further comprises, on its lower part, a pointed shape (7) for puncturing the weld of the two half-shells. The pointed part further comprises openings (8) to allow the coffee to pass through freely but to prevent the grounds from passing. When the capsule is introduced into its extraction system, the rod is pushed downwards so that the pointed shape (7) punctures the weld of the two half-shells.

Figure 3 shows a capsule (9) in the second embodiment of the invention. This capsule comprises a cup (10) and a membrane (11) welded at a peripheral welding edge

(13) forming the periphery of the said cup. The capsule contains a substance (12). The system for opening the capsule consists of a disc (14) arranged in the bottom of the cup (10) and comprising a puncturing point (15) and a filter (60). The puncturing point is therefore enclosed in the chamber formed by the cup (10) and the membrane (11). The disc is thus arranged at the bottom of the cup and thus forms a wider area over which the internal pressure may be spread during extraction. At the time of extraction, the capsule is introduced into the extraction device, water is introduced via a needle which punctures the membrane (11), and under the effect of the rise in pressure in the capsule, the disc (14) experiences a downward thrust towards the retaining part (16) so that the point (15) punctures the retaining part (16) of the cup, thus allowing the beverage to flow out. The capsule is held firmly in place by virtue of the support (61) and the filter (60) prevents the coffee grounds from passing into the mug (not depicted) situated under the said capsule.

Figure 4 shows another embodiment. The difference from the preceding figure is simply that instead of arranging the opening system in the cup, it is arranged in the membrane. The capsule comprises a cup (17) and a membrane (18) welded to the periphery of the said cup at (62). The substance to be extracted (19) is in the capsule. The disc (20) constituting the opening system has a puncturing point (21) and a filter (63). At the time of extraction, the rise in pressure in the capsule means that the disc (20) experiences a downward thrust towards the retaining part (22) and the point (21) punctures the retaining part (22) of the membrane. The filter (63) allows the coffee grounds to be held back.

Figure 5 shows the capsule according to the invention in its fourth embodiment. This capsule comprises a cup (23) and a membrane (24) welded along a peripheral welding edge (26) to the periphery of the said cup. The

capsule contains a substance to be extracted (25). The means allowing opening is arranged in a housing (27) at the bottom of the cup. This means consists of an element (28) with puncturing means covered by a thin film (29). The puncturing means are points (64) directed towards the thin film. As in the previous embodiments, the water is introduced through the membrane and the rise in pressure will press the thin film (29) against the puncturing means so as to tear the said thin film and the beverage can thus flow out into a mug arranged beneath. The element (28) thus has a filter function and for this purpose has a number of holes (65) for the passage of the beverage.

Figures 6 and 7 show the capsule according to the invention in an alternative form of its fourth embodiment. This capsule comprises a cup (66) and a membrane (67) welded along a peripheral welding edge (68) to the periphery of the said cup. The capsule contains a substance to be extracted (69). The means allowing opening is arranged in a housing (70) at the bottom of the cup. This means consists of an element (71) with opening means covered by a thin film (72). The opening means are points (73) distributed over the entire surface of the element (71) and directed towards the thin film (72). These means may also be recessed and raised elements of a shape other than that of the points depicted. As in the preceding embodiments, the water is introduced via the membrane (67) and the rise in pressure will press the thin film (72) against the puncturing means in such a way as to tear the said thin film and the beverage can thus flow out into a mug arranged beneath. The element (71) also has a filter function for this purpose and comprises a number of channels (74) for the passage of the beverage. The channels (74) are present at the surface of the elements (71) and thus separate the points (73) to form a beverage distribution network. The beverage flows along the said channels and ends up at the periphery

(75) of the element (71) where it flows to the inside (76) at the bottom of the cup (66). The openings (77) allow the beverage to run into the mug (not depicted) arranged beneath. The bottom (66) of the cup and the openings (77) together form the beverage collection and outflow means. The openings (77) are preferably made through the edges of a re-entrant tubular part of the cup which is delimited at its base by a small internal peripheral channel. Such a configuration allows controlled and less sudden flow and avoids liquid splashing out of the service region. As with Figure 5, we are talking here about a four-component capsule, the four components being the cup, the element with the opening means, the membrane and the thin film. The cup is fabricated by thermoforming and the disc is fabricated by injection moulding.

Figure 8 shows a perspective view of the means allowing the opening of the capsule according to the fourth embodiment. This means (80) is an injection-moulded disc placed on the bottom of the cup. It comprises raised elements in the form of cone frustums (81) and spaces (82) between the said raised elements. In the capsule, when the thin film is torn, the beverage flows along the spaces (82) towards the outside (83) of the disc. One might very well envisage the disc being at the bottom of the cup of Figures 6 and 7: the beverage flows over the inside (76) of the bottom of the cup (66).

Figure 9 shows another embodiment of the means of opening the capsule. This is a disc (84) allowing the capsule to be opened. This disc (84) is an injection-moulded wafer placed on the bottom of the cup. It comprises raised elements in the form of pyramids (85) and spaces (86) between the said raised elements. In the capsule, when the thin film is torn, the beverage flows along the spaces (86) towards the outside (87) of the disc. It is very easy to envisage the disc being at

the bottom of the cup of Figures 6 and 7; the beverage flows out over the inside (76) of the bottom of the cup (66).

Figures 10 and 11 show the capsule according to the invention in a fifth embodiment. In this case, we are talking about a three-component capsule. This capsule comprises a cup (88) and a membrane (89) welded along the peripheral weld line (90) onto the periphery of the said cup. The capsule contains a substance to be extracted (91). The means allowing opening is in the bottom of the cup. This means is in the form of raised elements (93) and recessed elements (94) forming the bottom of the said cup, the said means being covered by a thin film (92). As in previous embodiments, the water is introduced via the membrane (89) and the rise in pressure will press the thin film (92) against the raised and recessed elements so as to tear the said thin film and the beverage can thus flow out into a mug arranged beneath. The thin film (92) also has a filter function and the beverage flows in the recessed spaces (94). The beverage runs along the said spaces and ends up on a tubular portion comprising a central opening (95) in the bottom of the cup (66). This opening (95) allows the beverage to run into the mug (not depicted) arranged beneath. As mentioned hereinabove, we are talking about a three-component capsule, these components being the cup, the membrane and the thin film. The cup is fabricated by thermoforming and makes it possible directly to obtain the means of opening the capsule, namely the raised and recessed elements.

Figures 12 and 13 simply give perspective detections from beneath and from above of the cup (88) of Figures 10 and 11. The central opening (95) allowing the beverage to flow out at the time of extraction is clearly visible. This cup is thermoformed in a single piece using an appropriate thermoforming device. Thereafter, the thin film is sealed onto the internal

edges of the bottom of the cup, and the substance is filled, for example in an atmosphere of nitrogen or in some other atmosphere more or less free of oxygen and finally the membrane is sealed.

Figure 14 schematically shows the capsule (100) according to the invention in its extraction system. The capsule is trapped in elements (101) and (102) of the extraction system. The element (101) allows water to arrive on the top of the capsule via the duct (103) and the needles (104) perforate the top of the capsule. Sealing is guaranteed by the seal (106). The support element (102) holds the capsule in place and at the time of its opening beverage runs through the outlet (105) into the mug (not depicted) placed beneath.

Figure 15 shows the capsule in its sixth embodiment. By comparison with Figure 5, the difference lies in the position of the opening system which is positioned in a housing of the membrane instead of being in a housing of the cup. The capsule comprises a cup (30) onto which a membrane (31) is welded along a weld line (35). The capsule contains a substance (36). The opening system comprises an element (32) with puncturing means covered by a thin film (33). As with the previous capsule, the water is injected from the top of the cup and the rise in pressure inside the capsule presses the thin film (33) against the puncturing means of the element (32) and the beverage flows out through the centre (34) of the membrane.

Figure 16 shows a capsule with two symmetric half-shells (37, 38) welded along a weld line (39) and containing a substance to be extracted (42). The means allowing opening is arranged in the shell (38) and consists of a disc (41) with puncturing means covered by a thin film (40). As with the other capsules, the rise in pressure in the capsule pushes the thin film towards the puncturing means until the said thin film

tears. The beverage then runs into the mug arranged beneath.

Figure 17 shows the capsule in a last embodiment, in an exploded view. It comprises a cup (44) onto which a disc (46) is welded along the weld line (51). The capsule contains a substance to be extracted (43). The means allowing opening comprises a thin film (45) welded between the disc and the cup. The disc comprises a raised annular element (48) and an annular channel (49) for the outflow of the beverage. This capsule is perfectly suitable if the substance to be extracted is instant coffee. However, if the substance to be extracted is roasted ground coffee, then a filter (47) needs to be added to the capsule according to the invention, the filter being arranged under the thin film and thus serving to hold back the coffee grounds.
The procedure is then as follows: the capsule is introduced into an extraction device. This device comprises a means for opening the capsule at (50), the water runs into the capsule and the rise in pressure will press the thin film (45) against the annular element (48).

The thin film tears and the beverage flows out via the channel (49) into the mug arranged beneath. In this case, a support element (see Figure 14) is always needed for the disc, the said support element forming part of the extraction system.

The terms "puncture" and "puncturing" relate to one or more means whose function is to make an opening against a solid, flexible or otherwise, weakened or partially open, portion not only by puncturing in the strict sense of the term but also by any equivalent means such as cutting or breaking.
The term "beverage" covers any type of beverage that can be prepared from a soluble or partially soluble substance or substance that can be percolated and also

encompasses preparations of the soup, broth or other similar food preparation types.

Abbreviations:

PET = polyester
PP = polypropylene
EVOH = a copolymer of ethylene and vinyl alcohol
PVDC = polyvinylidene chloride
PE = polyethylene
PA = polyamide

Claims

1. Capsule designed to be extracted by injection of a fluid under pressure in an extraction device, containing a substance for the preparation of a beverage, comprising a closed chamber containing the said substance and a means allowing the said capsule to be opened at the time of its use and for allowing the said beverage to flow out.

2. Capsule according to Claim 1, characterized in that opening is achieved by relative engagement of the opening means with a retaining part of the closed chamber and in that the relative engagement is performed under the effect of the rise in pressure of the fluid in the chamber.

3. Capsule according to Claim 2, characterized in that the opening means is housed inside the closed chamber and in that it is moved by thrust under the effect of the rise in pressure of the fluid in the chamber against the retaining part of the chamber.

4. Capsule according to Claim 2, characterized in that the opening means is housed outside the closed chamber and in that the retaining wall is moved under the effect of the rise in pressure against the opening means.

5. Capsule according to Claim 2, 3 or 4, characterized in that the opening means is an element comprising at least one puncturing element.

6. Capsule according to Claim 4, characterized in that the retaining wall is a thin film able to be punctured.

7. Capsule according to Claim 1, characterized in that the closed chamber comprises two welded half-

shells and the means allowing opening is a rod arranged between the said shells, the said rod comprising at least one opening towards the top for the entry of water and, towards the bottom, a shape allowing the weld of the two shells to be punctured as the said capsule is placed in its extraction device, the said shape also forming a filter.

8. Capsule according to Claim 3, characterized in that the closed chamber comprises a cup and a membrane welded to the periphery of the cup and the means allowing opening is arranged in the bottom of the cup and comprises a disc with a puncturing means puncturing the bottom of the said cup through the rise in pressure inside the chamber.

9. Capsule according to Claim 3, characterized in that the closed chamber comprises a cup and a membrane welded to the periphery of the cup and the means allowing opening is arranged on the membrane and consists of an element with a puncturing means puncturing the said membrane through the rise in pressure inside the chamber.

10. Capsule according to Claim 4, characterized in that it comprises a cup with a rim and a bottom having an opening for the outflow of the beverage and a membrane welded to the periphery of the rim of the said cup and in that the means allowing opening is arranged in the bottom of the cup and in that the opening means is an element with a plurality of puncturing means covered by a thin film, this thin film tearing on the puncturing means at the time of extraction.

11. Capsule according to Claim 4, characterized in that it comprises a cup with a rim and a bottom having an opening for the outflow of the beverage and a membrane welded to the periphery of the rim of the said cup and in that the means allowing opening comprises

recessed and raised elements forming the bottom of the said cup covered by a thin film, this thin film tearing on the raised and recessed elements at the time of extraction.

12. Capsule according to one of Claims 9 and 10, haracterized in that the ratio of the diameter of the means allowing opening to the diameter of the capsule is between 1:6 and 1:1.

13. Capsule according to Claim 11, characterized in that the element with puncturing means is an injected disc or an element with a flat face with the means allowing opening and a curved face pressing against the bottom of the cup.

14. Capsule according to Claim 11, characterized in that the means allowing opening comprises recessed and raised elements on the bottom of the cup, the said bottom having, substantially at its middle, an opening for the outflow of the beverage.

15. Capsule according to Claim 4, characterized in that it comprises a cup and a membrane welded to the periphery of the cup and having an opening for the outflow of the beverage and in that the means allowing opening is arranged in a housing at the centre of the membrane and consists of an element with puncturing means covered by a thin film, the said thin film tearing on the puncturing means at the time of extraction.

16. Capsule according to Claim 4, characterized in that it comprises two welded half-shells, one having an opening for the outflow of the beverage, and in that the means allowing opening is arranged in the half-shell with the opening and consists of a disc with puncturing means covered by a thin film, the said thin film tearing on the puncturing means at the time of

extraction.

17. Capsule according to Claim 4, characterized in that it comprises a cup and a disc welded to the periphery of the said cup, the cup having an opening for the outflow of the beverage and in that the means allowing opening comprises a thin film welded between the disc and the cup and raised elements on the disc collaborating at the time of extraction with the said thin film to allow the opening of the said thin film through the rise in pressure.

18. Capsule according to Claim 16, characterized in that it further comprises a filter welded to the periphery of the cup between the thin film and the disc.

19. Capsule according to one of Claims 16 and 17, characterized in that the raised elements consist of a continuous or discontinuous annular element.

20. Capsule according to Claim 18, characterized in that the annular element is discontinuous and the disc comprises, between the annular elements, ribs directed towards the centre of the said disc.

21. Capsule according to any one of Claims 1 to 19, characterized in that the material(s) of the closed chamber is (are) chosen from the group consisting of aluminium, an aluminium/plastic composite, an aluminium/plastic/paper composite, plastic in the pure form or a multilayer.

22. Capsule according to Claim 20, characterized in that the material of the closed chamber is plastic chosen from the group consisting of EVOH, PVDC, PP, PE, PA, in a single layer or as a multilayer.

23. Capsule according to any one of Claims 5 to 21,

characterized in that the puncturing means are chosen from the group consisting of a point, a blade, a knife, a needle and the like.

24. Capsule according to any one of Claims 6 to 22, characterized in that the thin film is made of a material chosen from the group consisting of aluminium, an aluminium/plastic composite, an aluminium/plastic/paper composite, single-layer or multi-layer plastic.

25. Capsule according to Claim 23, characterized in that the material of the filter is chosen from the group consisting of filter paper, woven fibres and nonwoven fibres.

26. Capsule according to any one of Claims 1 to 24, characterized in that the substance for the preparation of a beverage is chosen from the group consisting of roasted ground coffee, tea, instant coffee, a mixture of roasted ground coffee and instant coffee, a chocolate product or any other dehydrated edible substance.

27. Process for the preparation of various beverages in a same machine, characterized in that the liquid of the beverage does not come into contact with the said machine and the capsule is supported from beneath by an element of the said machine.

28. Method for improving hygiene and reducing cross-contamination in the preparation of a beverage from a capsule containing a food substance in a closed chamber, said capsule incorporating its own opening device, characterized in that a fluid is introduced under pressure into the capsule and that, once the pressure inside the capsule reaches a certain level, the opening device is activated to open the capsule and release the beverage.

29. Method according to Claim 27, characterized in that the opening device is activated by the effect of the internal pressure which becomes established within the closed chamber.

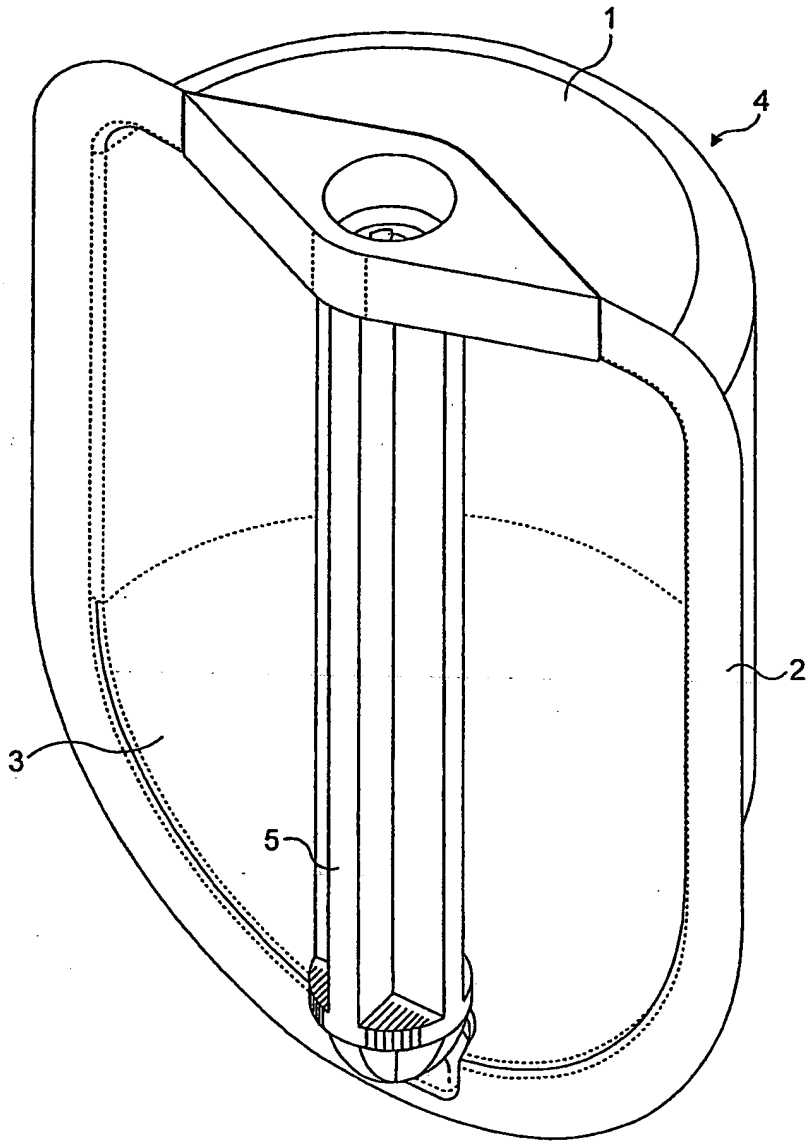


FIG. 1

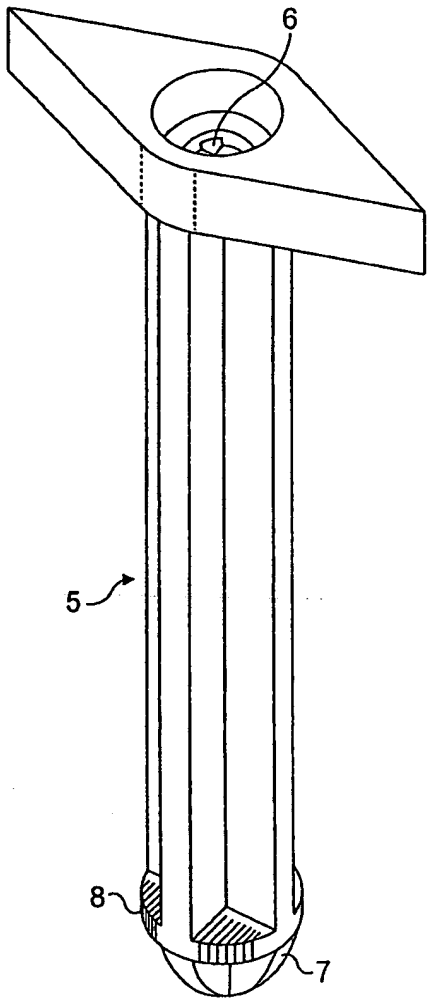


FIG. 2

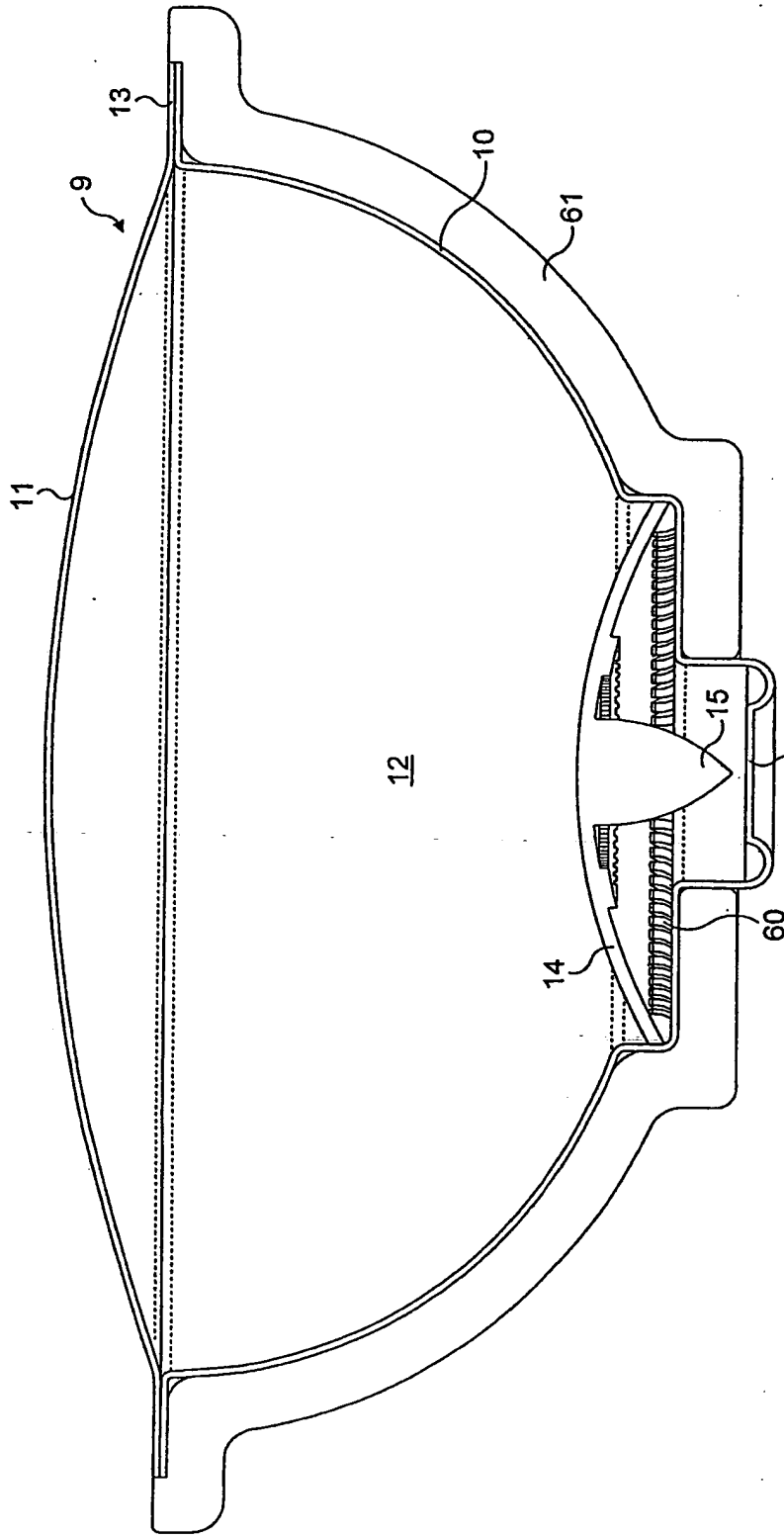


FIG. 3

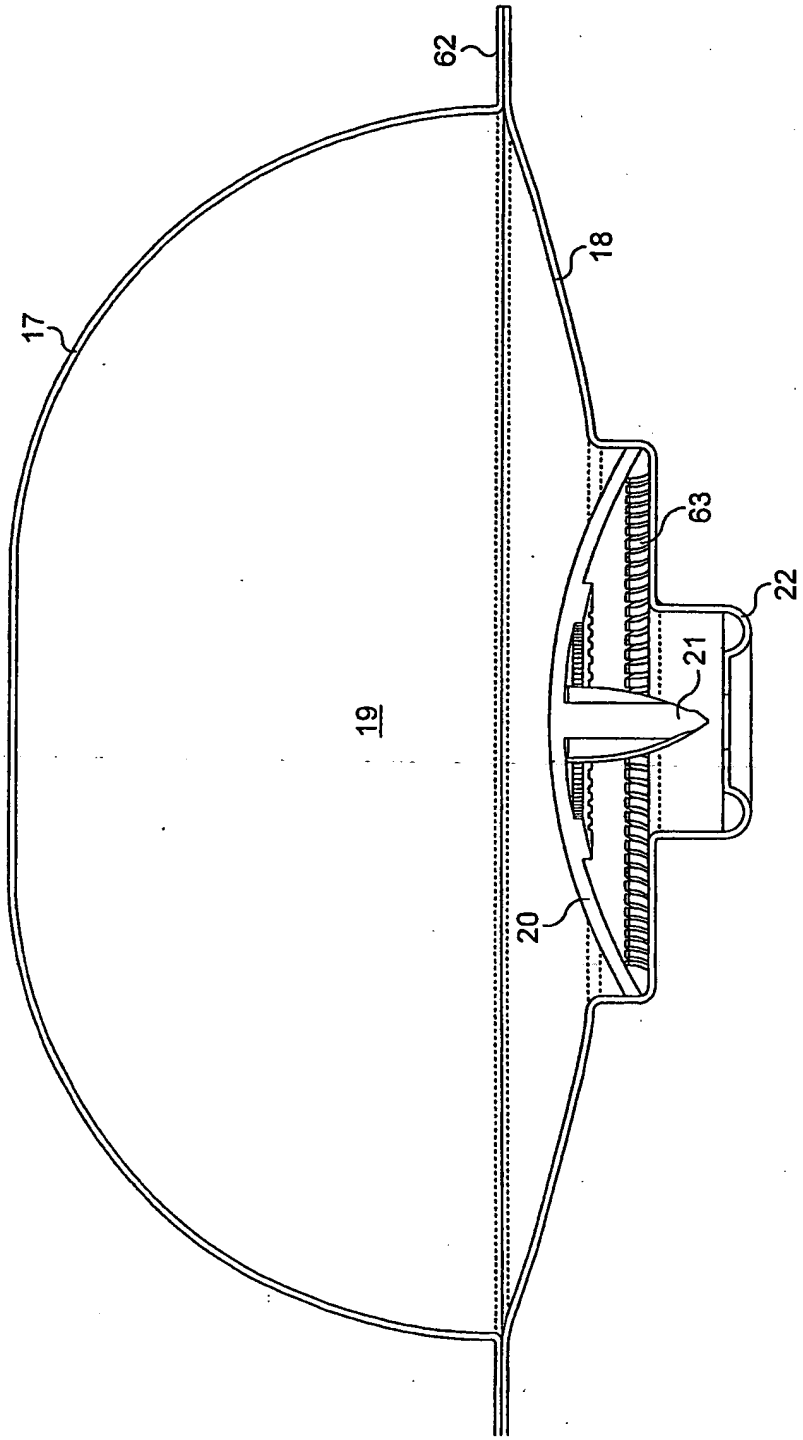


FIG. 4

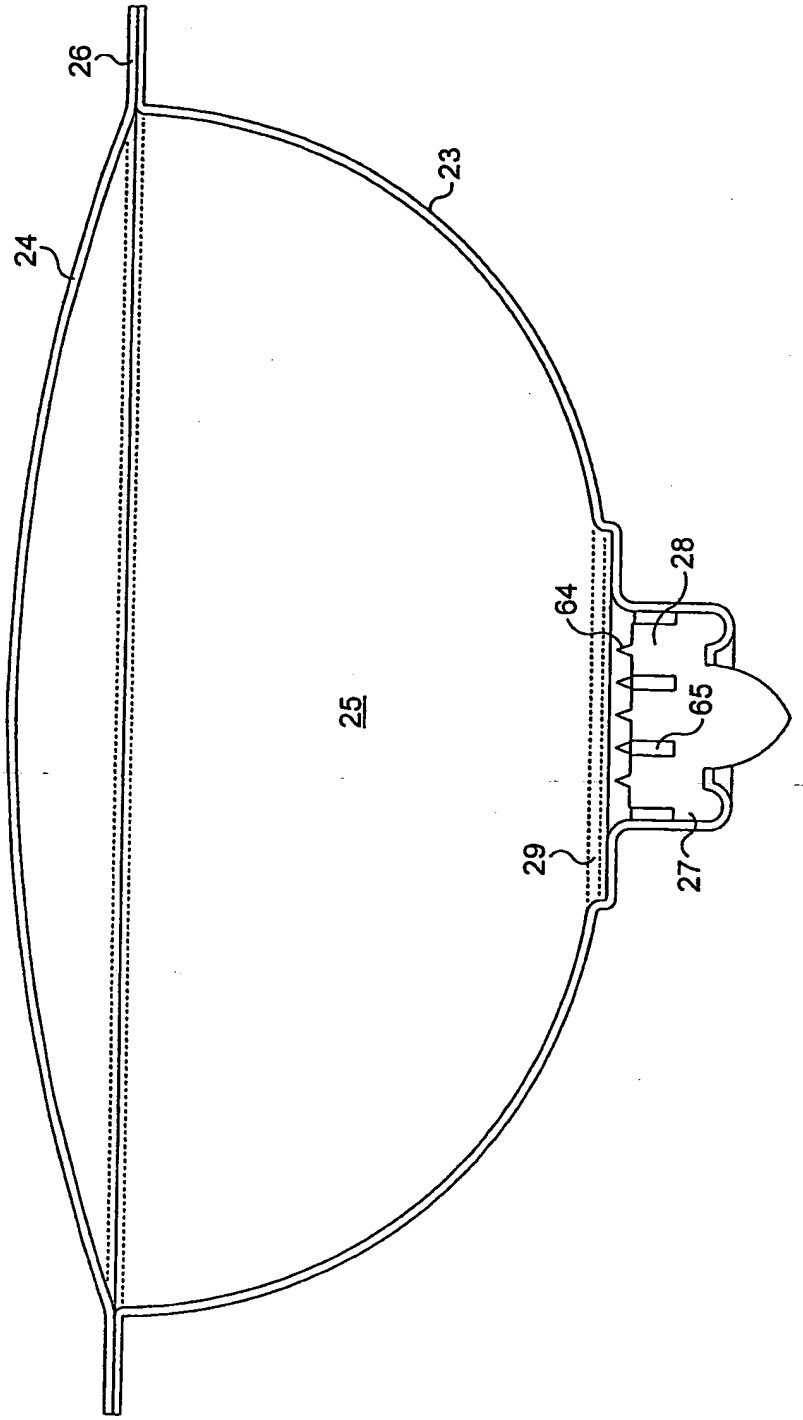


FIG. 5

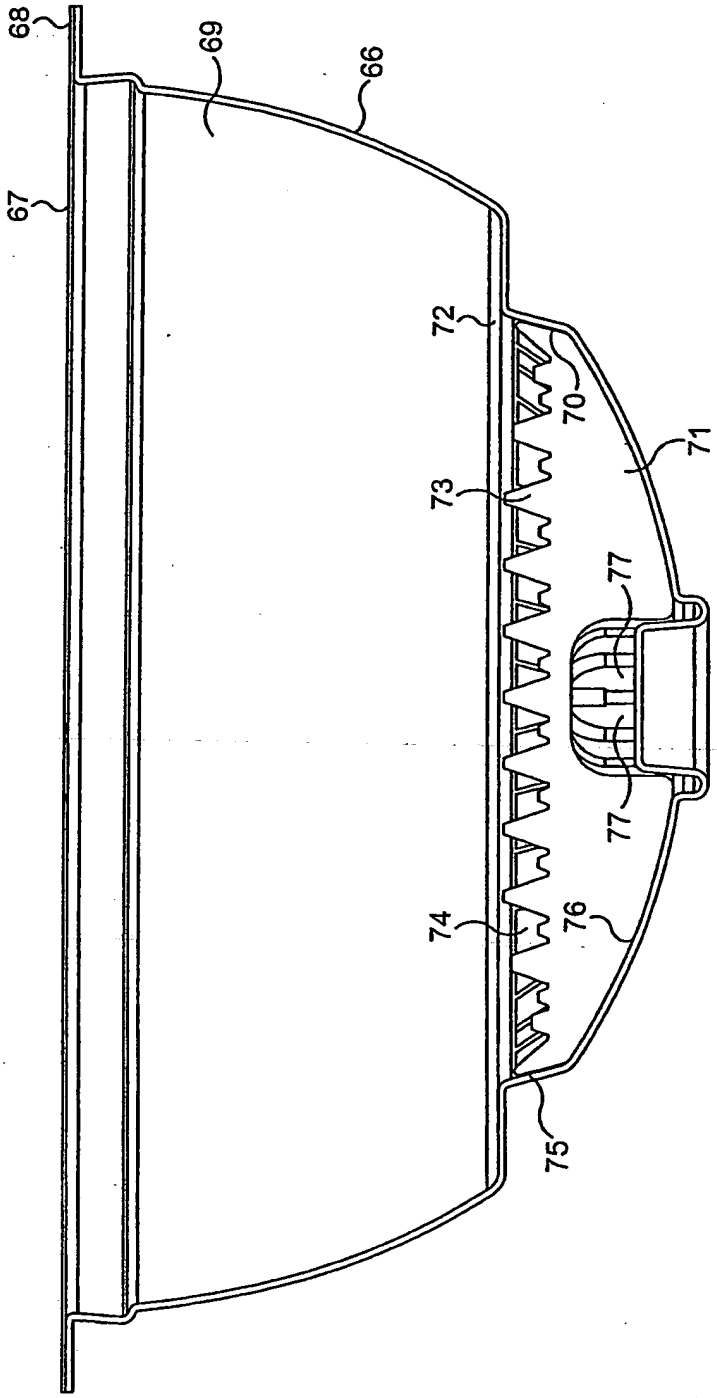


FIG. 6

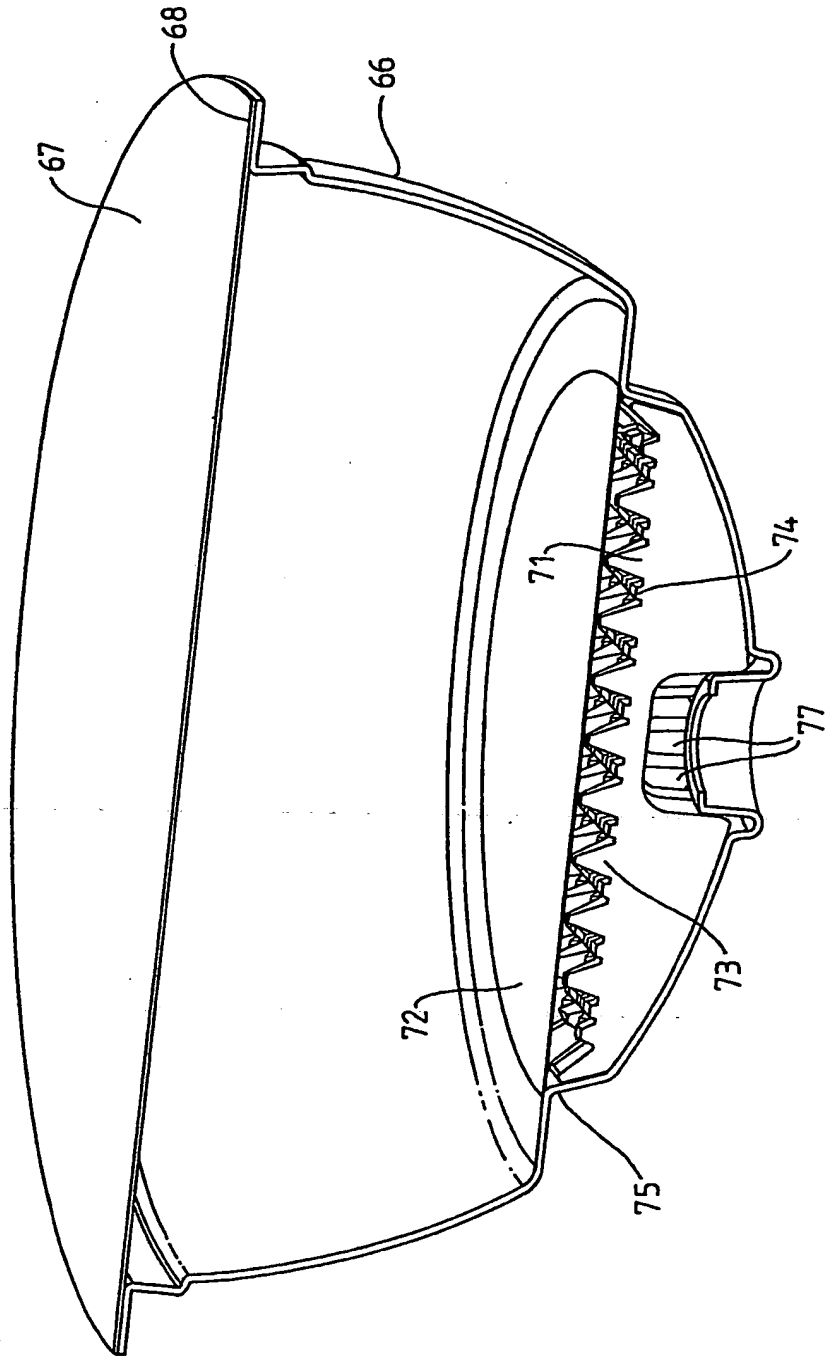


FIG. 7

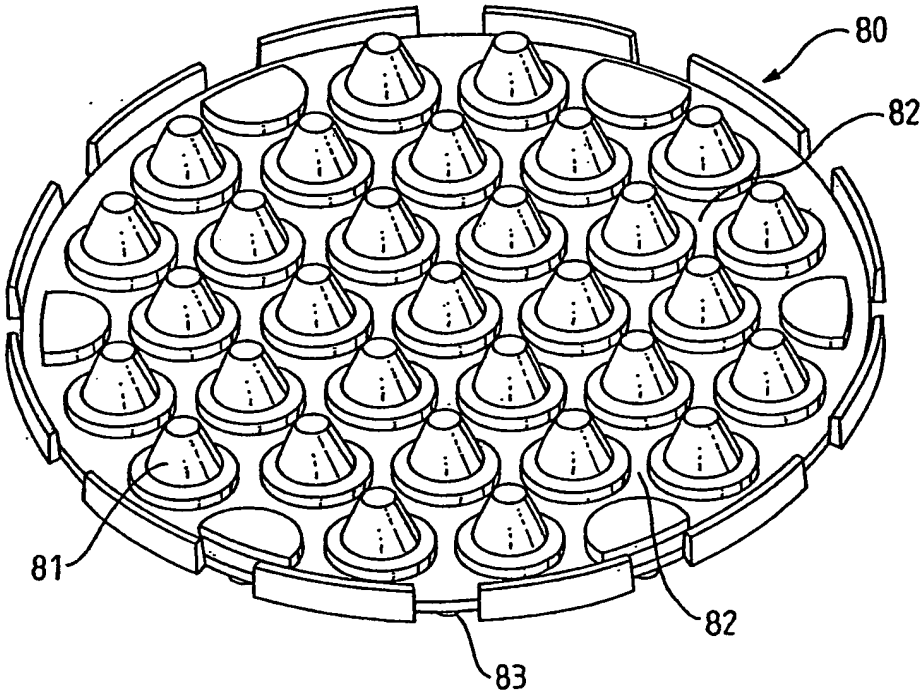


FIG. 8

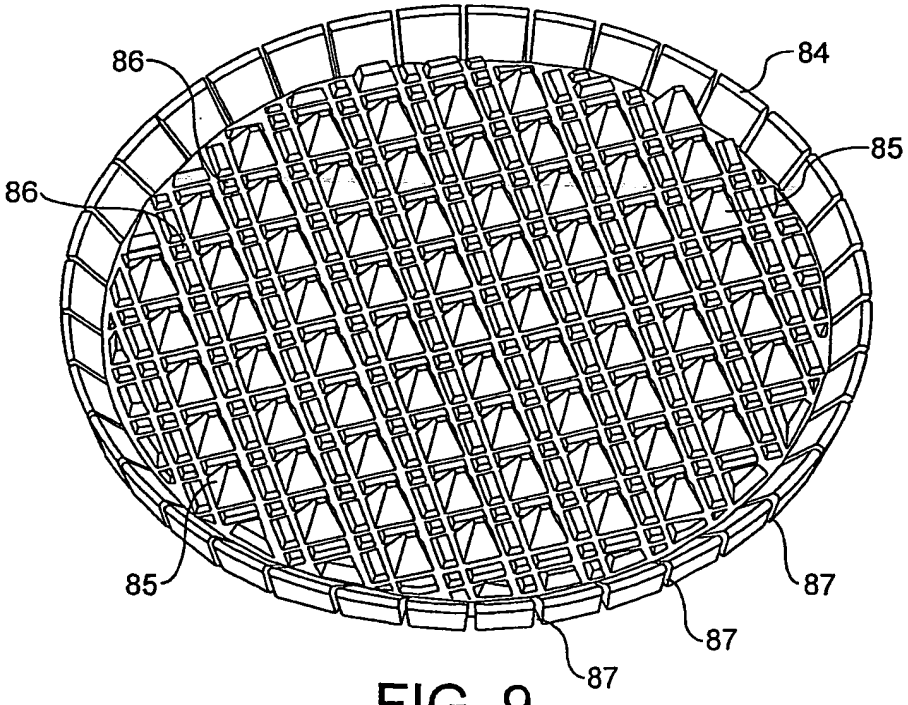


FIG. 9

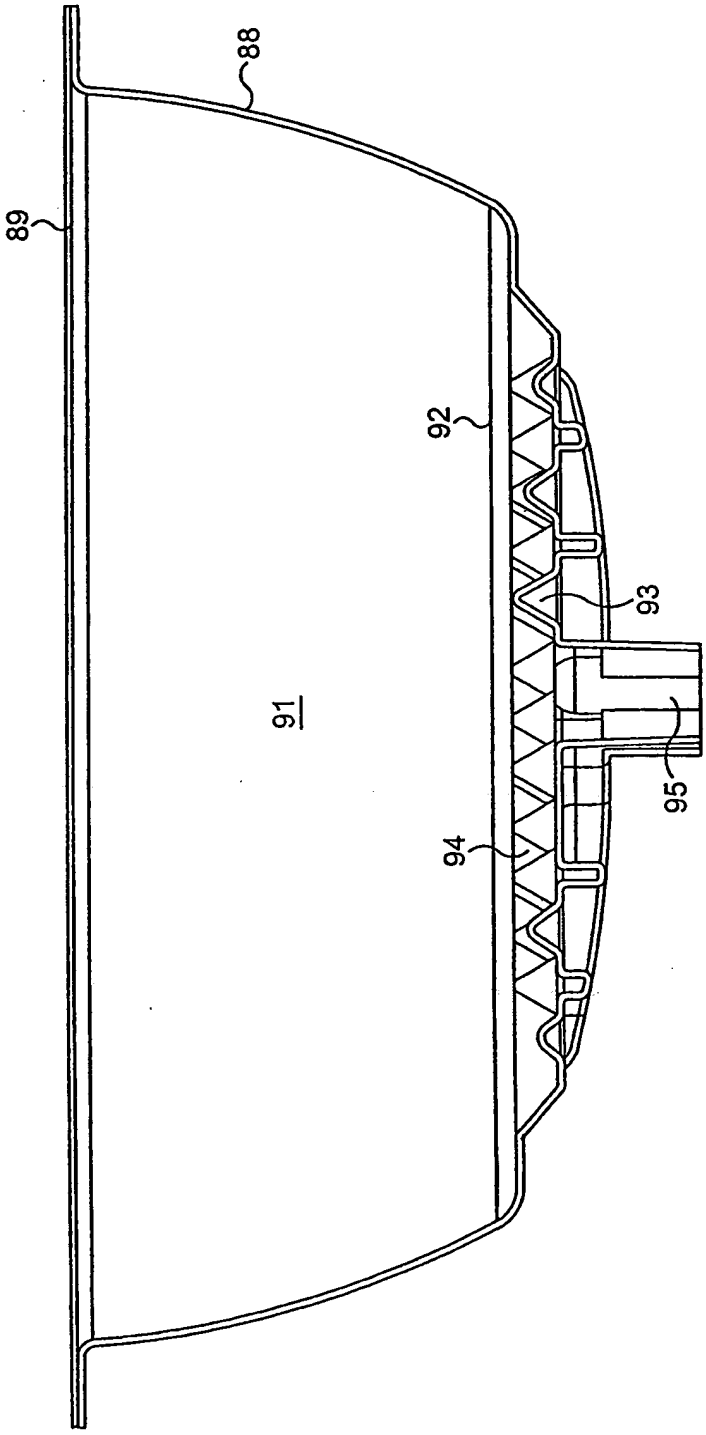


FIG. 10

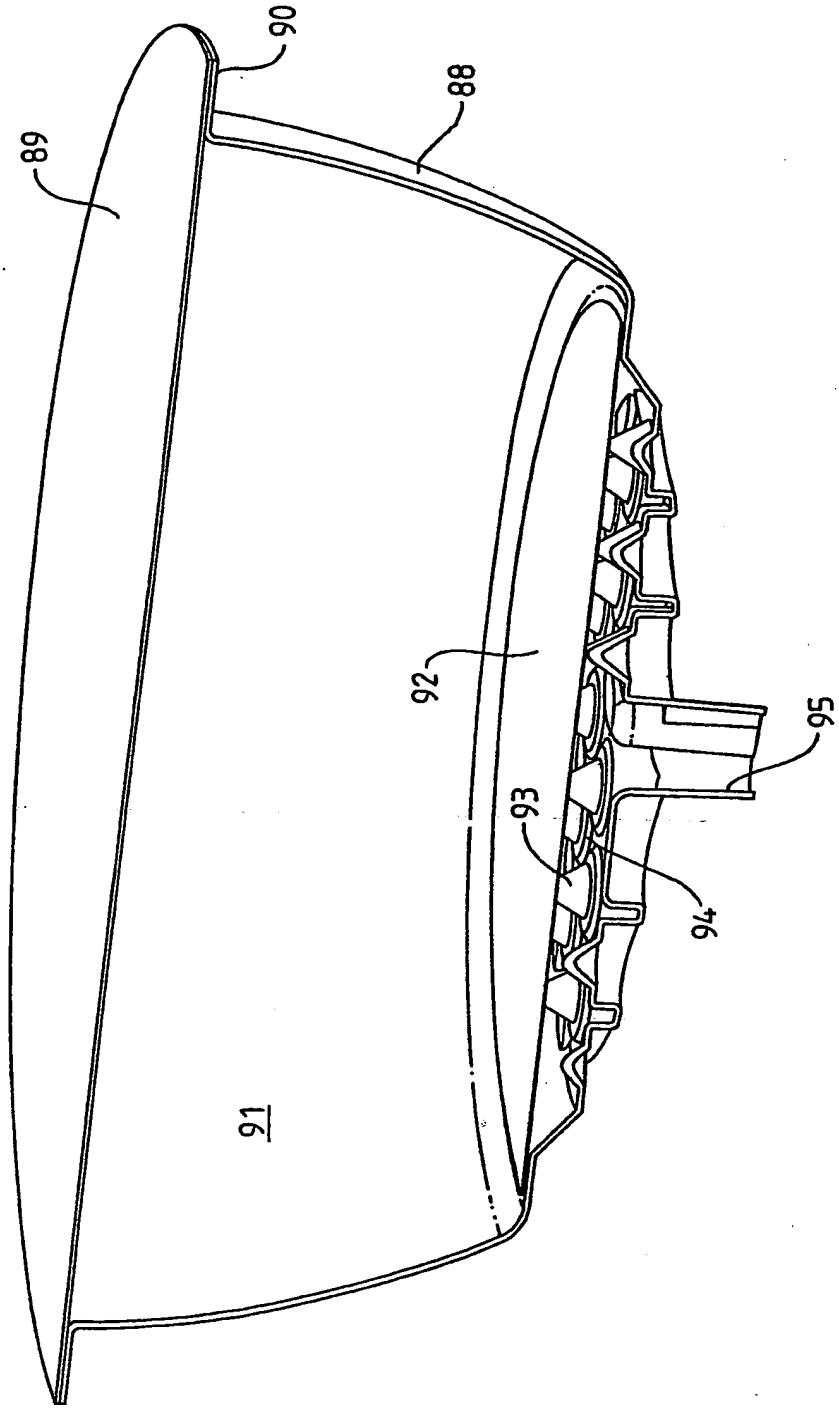


FIG. 11

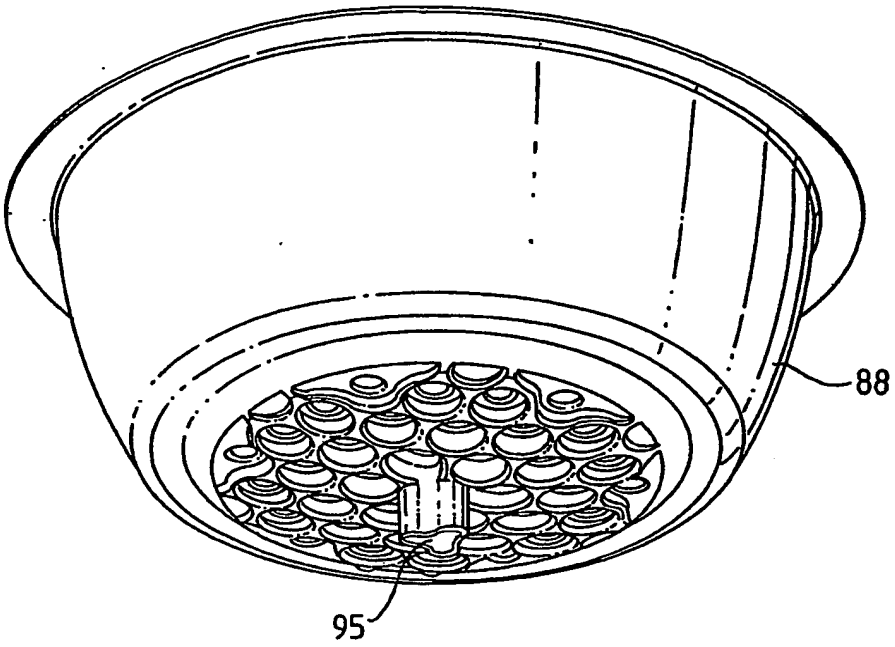


FIG. 12

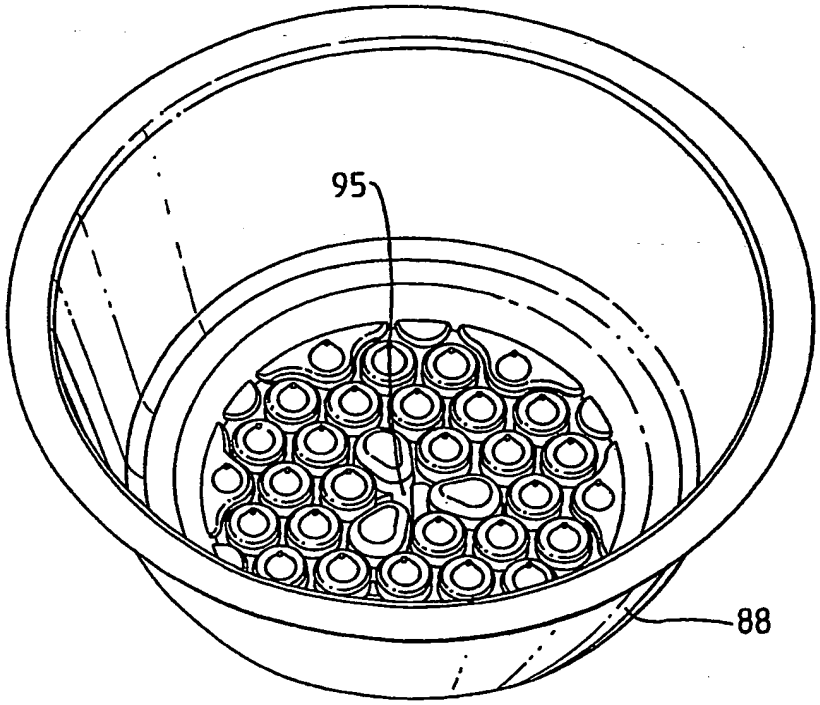


FIG. 13

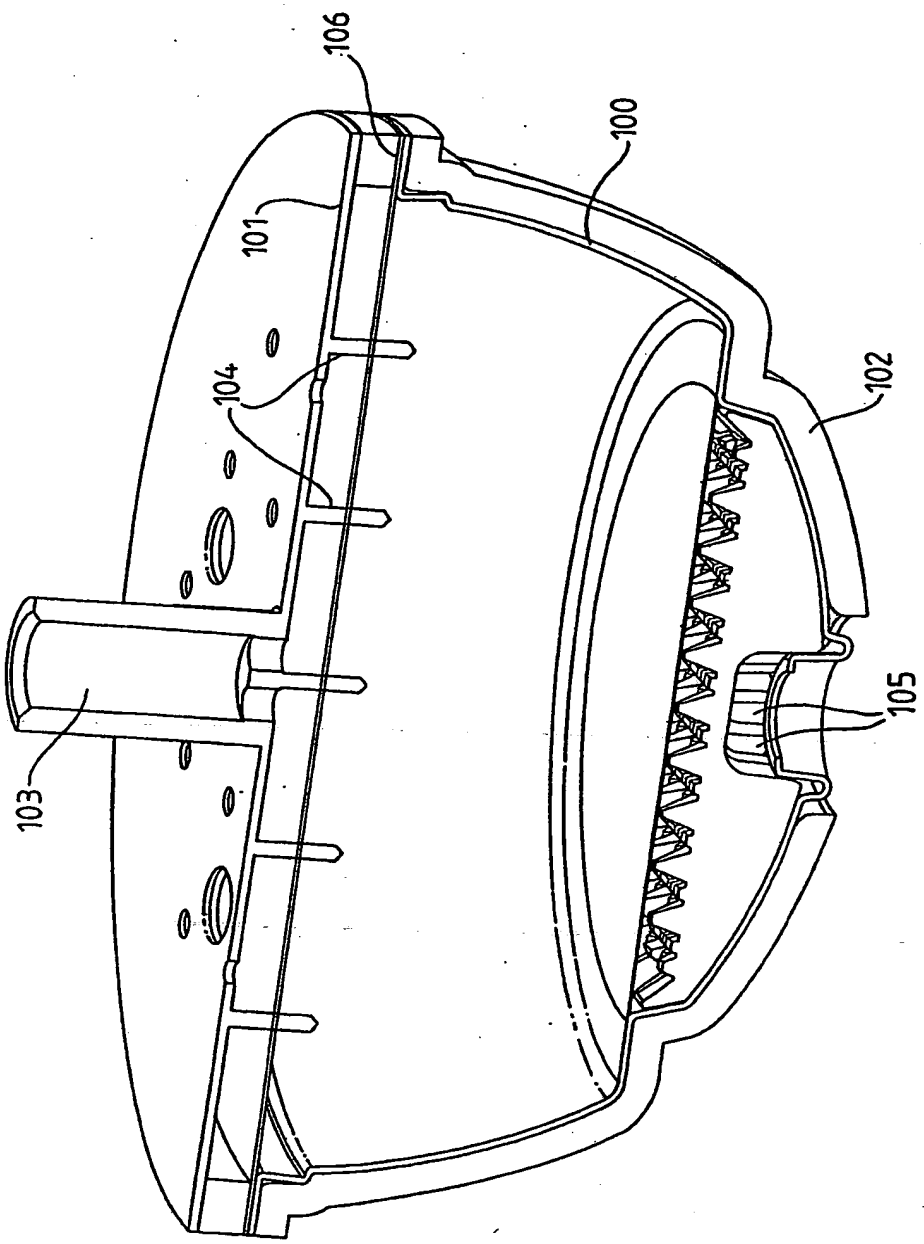


FIG. 14

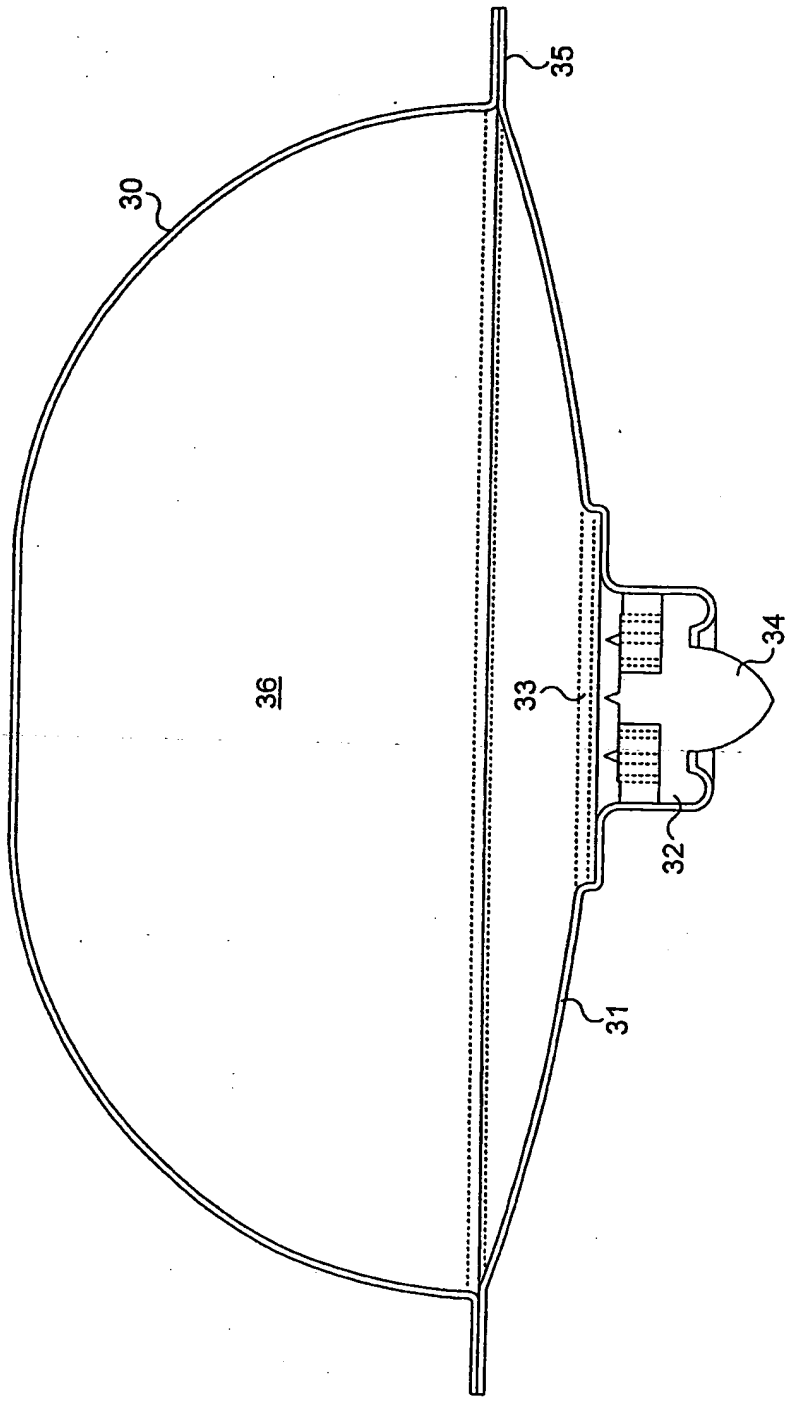


FIG. 15

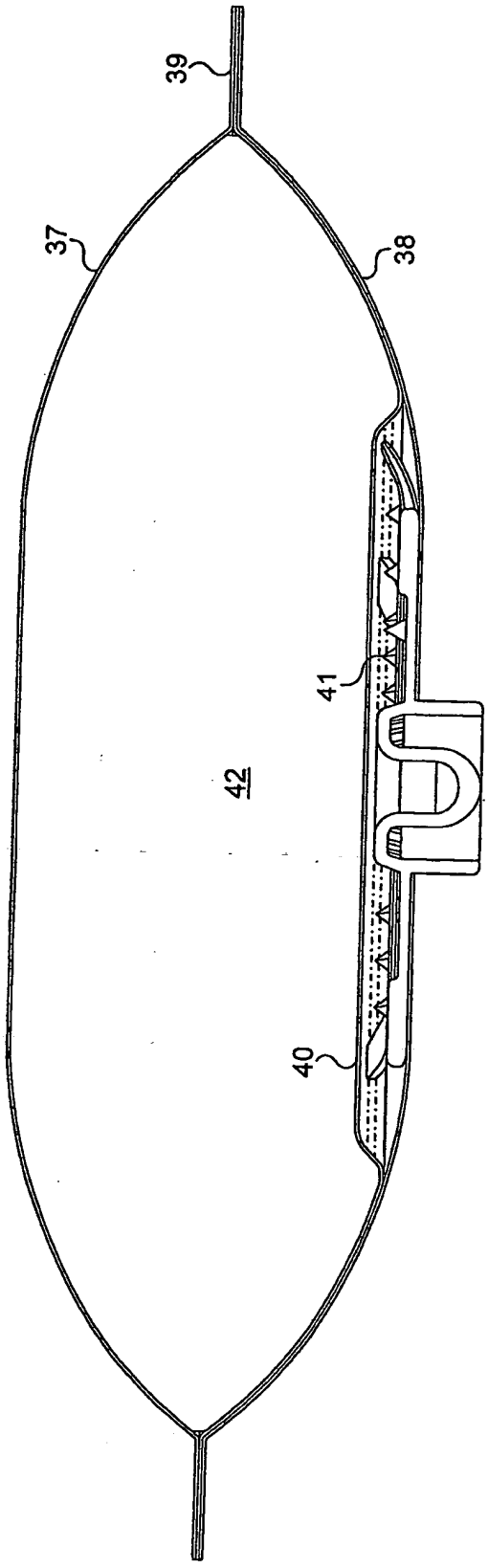


FIG. 16